Table VI-1

Advanced Television Service Grade II

	Planning Factors		Units	Channels 2-6		Channels 7-13		Channels 14-69	
				Zone-I	-II, III	-I	-I & III	-I	II & III
1.	Maximum Height Above Average Terrain (HAAT)		feet	1000	2000	1000	2000	2000	2000
2.	Geometric Mean Frequency		MHz	69	69	194	194	615	615
3.	ATV Effective Radiated Power (ERP)		dBK						
4.	Thermal Noise	(N_1)	dB/μV	2.6	2.6	2.6	2.6	2.6	2.6
5.	Receiver Noise Figure	(N_r)	dB	5	5	5	5	10	10
6.	S/N Ratio (Reference to Carrier)		dB						
7.	Line Loss	(L)	dB	2	2	3	3	5	5
8.	Receiver Antenna Gain	(G)	dB						
9.	Dipole Factor	(K_d)	dB	-3	-3	-12	-12	-22	-22
10.	F(L,T) Field		dBμV/m						
11.	F(50,50) Field		dBμV/m						
12.	To Overcome Urban Noise	(N_u)	dB	0	0	0	0	0	0
13.	To Overcome Rural Noise	(N_r)	dB	0	0	0	0	0	0
14.	Required Median Field		dBμV/m						
15.	Receiver Antenna Discrimination		dB						
16.	Cross-Polarization Factor		dB						
17.	Co-channel D/U no offset	a. ATV-NTSC	dB						
		b. NTSC-ATV	dB						
		c. ATV-ATV	dB						
18.	Co-channel D/U Nominal offset	a. ATV-NTSC	dB						
		b. NTSC-ATV	dB						
		c. ATV-ATV	dB						
19.	Co-channel D/U Precise offset	a. ATV-NTSC	dB						
		b. ATV-ATV	dB						
		c. ATV-ATV	dB						
20.	Adjacent Channel D/U (Lower)	a. ATV-NTSC	dB						
		b. NTSC-ATV	dB						
		c. ATV-ATV	dB						
21.	Adjacent Channel D/U (Upper)	a. ATV-NTSC	dB						
		b. NTSC-ATV	dB						
		c. ATV-ATV	dB						
22.	Taboos - See separate list								

Items 17-22 in Table VI-1 will be used to determine the extent of interference from other stations permitted within the ATV service area resulting from the maximum mileage separation for cochannel, and adjacent channel, and taboo-related stations.

These contours indicate the approximate extent of coverage over average terrain in the absence of interference from other television stations. Under actual conditions, the true coverage may vary greatly from these estimates where the terrain differs from the average terrain on which the field strength propagation curves are based.

To develop planning factors for an Advanced Television Allotment Plan, PS/WP-3 established Specialist Group 10. This specialist group used as its point of departure the factors used in the development of the NTSC channel Allotment Plan. It modified these factors to take account of the new information which would have to be added for ATV channels. Table VI-1 represents the status of development of the parameters. In general, the factors fall into three categories: a) those which can be identified now; b) those which can be determined in the near future; c) those which cannot be determined until after tests of proponent systems have been carried out.

The status of development of these factors is as follows:

(1) Maximum Height Above Average Terrain (HAAT). The antenna heights indicated are the existing maximum values. These values were used since such antennas do exist and could

possibly serve as the supporting structure for the ATV antennas. Stations exceeding these heights would be subject to an appropriate reduction in allowable effective radiated power.

(2) Geometric Mean Frequency. This factor is used to determine the effective length of the receiving antenna, or the dipole factor (item 9). The value for any specific channel might differ from these geometric mean values, but for this generalized approach these values are appropriate. (The maximum difference of the value is 2 dB for channels 2-6; but only 1 dB for 7-13 and UHF).

(3) ATV Effective Radiated Power (ERP). This very important parameter is still under development and has been the subject of considerable discussion (see below).

(4) Thermal Noise. The indicated value is the inherent noise within 6 MHz across 75 ohms.

(5) Receiver Noise Figure. The values indicated are typical values that may be expected for new ATV receivers.

(6) Carrier-to-Interference Ratio. This parameter cannot be determined until ATTC/CRC tests are performed.

(7) Line Loss. The indicated figures are based on 35 feet of RG-59-U.

(8) Receiving Antenna Characteristics. Information has been requested from manufacturers of receiving antennas.

(9) Dipole Factor. The indicated values are based on a 75 ohm impedance and the geometric mean frequency for the band, i.e. Dipole Factor = 20 log 48.341/F (with F in MHz).

(10) F (L,T) Field. Values for L and T will be added based on appropriate location and time probability functions after the service statistics are determined.

(11) F (50,50) Field. With the FCC's F (50,50) propagation curves, the transmitting antenna height (1), and ERP (3), this value will determine the service contour.

(12) Urban Noise. For ATV Service Grade II, no allowance is indicated to overcome urban noise. However, for Service Grade I, if necessary, urban noise factors of 14 dB for channels 2-6, 7 dB for channels 7-13, and 0 dB for UHF should be used.

(13) Rural Noise. For ATV Service no allowance is indicated to overcome urban noise.

(14) Required Median Field. This is the required median field associated with ATV Service Grade II (the noise limited contour which may be different for different ATV systems).

(15) Receiver Antenna Discrimination. It has not been determined if this factor is necessary.

(16) Cross-Polarization Factor. It has not been determined if this factor is necessary.

C. Spectrum Criteria for a New Terrestrial ATV Simulcast System

During this period, SS/WP-4, which is charged with recommending an ATV standard, requested a statement from PS/WP-3 on how to judge the spectrum related aspects of a particular system. A response was formulated and agreed to on 11 September 1990 and then forwarded to SS/WP-4. This statement made the following points:

(1) The ATV System must afford the opportunity for substantially all existing television stations to have an ATV service area comparable to the NTSC Grade B service area.

(2) This requirement must be achieved with ATV-to-NTSC and ATV-to-ATV minimum cochannel spacing in the order of 160 km (100 miles).

(3) The criteria that the systems must meet are --

(a) minimize interference to existing NTSC stations;

(b) insensitivity to interference from NTSC or other ATV stations, and

(c) provision of satisfactory ATV service at a carrier-to-noise ratio lower than that applicable to the NTSC service.

Any new ATV system must satisfy these criteria. The PS/WP-3 statement went on to indicate the procedure for determining the satisfaction of these criteria through the ATTC laboratory tests:

> Although both the VHF and UHF television bands are expected to be utilized in any simulcast ATV system adopted, studies show that most of the accommodation must come from the UHF band. Characteristics of NTSC receivers have required that restrictions be placed on the use of as many as sixteen channels other than the same or first adjacent channels. Those channels so restricted are referred to as "taboo" channels. Utilization of those taboo channels is essential to provide the spectrum needed for terrestrial simulcast broadcasting of ATV. Laboratory tests will demonstrate if that threshold is satisfied by any ATV system, or the extent that some taboo restrictions must be retained for the protection of NTSC or ATV reception.
>
> The laboratory will provide data also on the noise-limited service afforded by each proposed ATV system, interference to and from NTSC and ATV-to-ATV interference. For the

cochannel case, interference to NTSC will be made at two NTSC receiver input levels corresponding, approximately, to receiver inputs at the Grade B and Grade A signal contours. ATV power levels will be referenced to a common base. Unlike NTSC, where the peak of sync provides a constant reference for power determination, ATV systems are not expected to include comparable capability. Consequently, the selection of a reference for the ATV systems will require a degree of subjectivity. However, the power reference so determined is expected to provide a common base permitting systems to be compared.

Service predictions for each ATV system studied will start with the undesired ATV signal level, above or below the reference power at the receiver input, causing objectionable cochannel interference to NTSC reception. Then, using propagation data appropriate to the television band, and assuming 160-kilometer cochannel spacing and height above terrain similar to that used for NTSC, the permissible transmitted level of power above the reference will be determined. The degree of interference to NTSC permitted will be comparable to that caused by NTSC-to-NTSC at typical cochannel spacing.

Having determined the permissible ATV transmitted effective radiated power, test data on service limitations imposed by noise, and interference from NTSC-to-ATV, will be applied to predict the extent of the ATV service. Available propagation data pertinent to the television band will be used again, in conjunction with the permissible power level determined as described in the previous paragraph. The calculations will provide a determination of the extent that ATV service will be interference-limited or noise-limited.

In the event that the foregoing does not yield an ATV service area at 160-kilometer spacing comparable to the service area provided by NTSC, cochannel spacing will be increased until that objective is achieved. An analysis will then be made of the accommodation statistics applicable to the increased cochannel spacing.

> In the event that laboratory testing demonstrates the need to retain taboo restrictions for particular ATV systems, spectrum analyses will be made to evaluate the impact of those restrictions on accommodation.

It is anticipated that SS/WP-4 will provide data of the nature described above to PS/WP-3. Subsequently, PS/WP-3 will "provide an analysis of the extent that proponents have satisfied the criteria set forth above. Success or failure will be measured by the size of the ATV service provided simultaneously with maximum accommodation of either increasing cochannel spacing to improve service area size, or limiting channel usage because of taboo restrictions."

D. Evaluation of ATTC Information

In anticipation of the above, PS/WP-3 has also initiated steps to evaluate the measurement information which will be provided for purposes of providing service area evaluation of the proponent systems. This effort was undertaken as a consequence of the initiative by Zenith to develop computer software of its own as described in Section V. It is offering to make it available to PS/WP-3. Its stated purpose is to provide a methodology for "objectively differentiating the proponent systems from the viewpoint of service area and interference impact from both on and from existing NTSC service."

It is intended that the characteristics of this program provide outputs of:

- NTSC Grade B contour
- Noise limited ATV service contour

- Equivalent signal power at ATV receiver input in dBm versus distance from ATV transmitter
- Time variability conversion versus distance from 50% to 90%.

The inputs to the program are:

Band	LV, HV, U
Desired ERP	dBK
Undesired ERP	dBK
Desired HAAT	feet
Undesired HAAT	feet
Transmitter Spacing	miles
NTSC and ATV Ant F/B	dB
Ant. Gain	dB
Line Loss	dB
Receiver NF	dB
ATV C/N	dB
ATV D/U	dB

The Working Party agreed to pursue development of this capability. In addition, coordination has been established with the ATTC to provide data in the proper format.

In summary, WP-3 has made substantial progress in establishing Planning Factors which can be used to provide a basis for coverage area evaluation for proponent systems.

E. Discussion on the Definition of Power Levels

The Working Party spent considerable time in discussing the definition and proper measurement of ATV Effective Radiated Power listed in Subsection A, above. Zenith present-

ed a paper which indicated, after extensive analyses, that to avoid measurements leading to wrong conclusions (in the measurement of ATV proponent power), Levels 2 and 3 in the test procedure developed by SS/WP-2 should be at 15 dB and 30 dB above a reference level, respectively. It was Zenith's view that obtaining measured information at these levels would provide a better indication of a system's interference immunity.

As a consequence of these discussions, and similar discussions in other related committees, it is understood that the ATTC test plan was modified to accommodate this problem. In connection with this issue, PS/WP-3 also communicated to SS/WP-1 to indicate that the "dynamic range of the test receivers should become part of the certification process".

VII. FUTURE WORK

During the next reporting period, Specialist Group 3, the specialist group assigned responsibility for analyzing the impact of ATV on broadcast support services and non-broadcast spectrum uses, will (a) analyze the responses received from the proponents regarding carriage of their particular ATV signals on microwave and other types of contribution and distribution circuits, (b) survey existing manufacturers of contribution and distribution equipment regarding issues associated with the transmission of ATV signals on their systems, and (c) continue to further narrow the set of recommendations in the area for which it is responsible.

During the next reporting period, Specialist Groups 6 and 7 will continue their work dealing with broadcast spectrum availability for ATV systems. In particular, they will complete their currently on-going studies regarding the impact of "taboos" that are potentially applicable to ATV systems. In addition, these specialist groups will continue their efforts regarding the possible development of the computerized service area and interference model for evaluating and comparing ATV transmissions systems. Following the work just described, further efforts by these two specialist groups will, by and large, have to wait on the results of the tests of the proponent ATV systems by the ATTC.

Specialist Group 9, which has been working on cross border issues involving Canada and Mexico, will reinforce its efforts to re-establish contacts and a constructive working relationship with appropriate Canadian representatives, and to establish initial contacts with appropriate Mexican officials.

Finally, Specialist Group 10, will continue its work in establishing the recommended planning factors that will form the technical structure for determining the basic service areas for the new ATV service. In particular, the specialist group anticipates acquiring information from the manufacturers of television receiving antennas regarding the technical characteristics of their products. This specialist group will also continue to consider the proper definition of coverage areas for ATV systems while paying particular attention to the special characteristics of digital transmissions systems.

Appendix A

Microwave Technical Specifications

Conventional microwave communications of video/audio signals for terrestrial transmission utilize a number of bands. Following are the principle bands and bandwidth:

Band (in GHz)	BW (in MHz)
2	17
7	25
13	25
18	20, 40, or 80

Appendix B

Electrical Performance of NTSC Microwave Links

The electrical performance of NTSC microwave links is established by national standard, ANSI/EIA/TIA-250-C-1989. Many of the specifications are couched in terms of NTSC parameters. Furthermore, different performance requirements are made depending on the number of links (or hops) and the total distance traveled. A few of the most stringent requirements ("Short Haul" classification) that might be applicable to ATV channels are:

Amplitude Frequency Response

0.1 dB	(.01-0.5 MHz)
0.1 rising to 0.18 dB	(0.5-3.0 MHz)
0.18 falling to 9.1 dB	(3.0-3.25 MHz)
0.1 dB	(3.3-3.9 MHz)
0.1 rising to 0.18 dB	(3.9-4.2 MHz)

Envelope Delay Response

50 ns	(0.2-3.6 MHz)

Signal-to-Noise Ratio
67 dB

Signal-to-Low-Frequency-Noise Ratio
53 dB

Signal-to-Periodic-Noise Ratio
67 dB

In addition to these requirements, there are a number of distortions that are measured strictly in terms of NTSC performance. They include:

Chrominance to Luminance Gain and Delay Inequalities
Field, Line and Short-Time Distortions
Insertion Gain and Variation
Luminance Nonlinearity
Differential Gain and Phase
Chrominance-to-Luminance Intermodulation
Chrominance Nonlinearity Gain and Phase

Appendix C

Fiber Optics

Use of optical fiber transmission as a substitute for radio frequency transmission in broadcast auxiliary operations may provide additional contribution and distribution channels where these facilities are available, where they are economic, and where mobility is not required. Broadcast auxiliary operations embrace studio-to-transmitter links (STLs), remote program pickups, studio-to-studio transmission feeds, and electronic news gathering (ENG). These operations are currently supported by point-to-point microwave radio (fixed, temporary-fixed and mobile), satellite transmission, coaxial circuits, and, to some extent, fiber optic media. In many circumstances, availability and economics interact to favor the use of radio-based technologies over fiber optic or other land line transmission means.

While intercity and local fiber optic installations by telecommunications companies are continuing at a good pace, fiber is not omnipresent. In addition, within any given geographic area, fiber is not available at or near every location where there could potentially be a television broadcast. In many instances, it might not be feasible to extend fiber to a particular site for a single or occasional television broadcast.

For example, if the available time to prepare for the broadcast of a remote event is not in the order of a week, or so, it may not be possible to arrange for the provision of

non-radio facilities. Television coverage of events by fiber optics is, by necessity, restricted to those situations that are known far enough in advance or where facilities are already in place. Existing circuits would be available for news and special events only in the most fortuitous circumstances where a fiber optic cable with idle capacity already exists at the venue, or where the predictability of demand for coverage has justified the installation of permanent circuits.

The economics of support circuit provisioning are also important. Precluded from the use of radio based equipment operated by the broadcaster, the necessity to use facilities rented from a telecommunications company could be sufficiently costly that televising an event might not be economically feasible, since many remote pickups are accomplished with microwave equipment owned by the television station and set up and operated by the station's personnel already on site for accomplishing other aspects of the telecast. Telecommunications companies not only charge for the rental of the transmission capacity, but also recover the cost of construction. Where the cost of construction must be recovered from the one-time use of a facility, the charges involved can be higher than if a different technology is used. Some common carrier tariffs for facilities have actually made short haul transmission by satellite more affordable. Also, more and more owners of buildings are demanding a payment for the physical penetration of their properties with the fiber cable and for the running of conduit through the building premises. Similarly,

for more permanent facilities, the use of fiber to replace existing station-owned STL microwave could result in initial construction charges and recurring operating costs with payments to the telecommunications company and potentially to property owners as well.

The use of fiber for ATV (or NTSC) broadcast auxiliary may not be viable in many circumstances. While fiber optic facilities may be the medium of choice in some situations, it is not yet sufficiently available or economical to provide a viable alternative for displacing all use of spectrum in support of ATV broadcast auxiliary operations.

Appendix D

Attendance (Alpha by Name)

Advanced Television Committee
Planning Subcommittee WP-3
Spectrum Utilization Working Group
Attendance (Alpha by Name)

Name	Affiliation	Mtg: 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
Aileen Amarandos	Latham & Watkins							x	x																												
Harvey Arnold	North Carolina Public TV																																	x	x	x	x
Paul Beeman	Viacom Networks								x	x	x	x																									
Krishma Bhatnagar	COMSAT																																x				
Martin Billips	NPR																																				
Christina Black	George Washington University		x	x	x		x	x	x	x																											
William M. Borman	Motorola	x	x		x	x	x	x			x	x	x		x		x	x				x								x	x						
Kenneth Brown	Capital Cities/ABC										x																										
Karen Brown	GAO/IMTEC																										x										
Frank Bugg	PBS				x	x	x	x		x	x				x																						
William Byrnes	Haley, Bader & Potts																					x									e						
Karen Christansen	NPR			x		x																															
Lynn Claudy	NAB																x	x					x	x	x	x	x		x		x	x	x		x		
Jennifer Clayborne	GAO														x																						
David Cohen	NTIA		x					x	x																												
Jules Cohen	Jules Cohen & Associates/MST			x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x		x	x	x	x	x	x		x		x	x	x		x
Ed Cohen	NAB																							x													
Ted Coltman	Corp. for Public Broadcasting			x	x	x	x	x		x	x	x		x	x	x	x				x			x		x	x			x	x					x
Ben Crutchfield	ATTC										x								x																		
Aldo G. Cugnini	Philips Labs																											x									
Kathy Dale	Televisa			x																																
Pat Daley	Bellcore																																		x		
Allen Davidson	Motorola																					x						x									
Hector Davis	FCC Laboratory																																		x		
Gregory DePriest	MST	x	x		x	x	x	x	x			x	x	x	x	x										x		x									
Robert DeSantis	ATTC																									x											
Bob Denny	Jules Cohen & Associates/MST	x	x	x	x	x	x	x	x	x	x																										
Joe Donahue	Thompson C.E.																																x				
Linda Dubroof	FCC																									x											
Ken Dunmore	Economists Inc.													x																							
A. James Ebel	Network Affiliats			x	x																																
Bob Eckert	FCC									x		x	x	x	x		x					x	x		x	x		x			x	x	x	x		x	x	x
Chris Ehrenbard	HBO				x	x	x									x																					
James G. Ennis	Fletcher, Heald & Hildreth	x						x	x		x								x								x	x					x				

Advanced Television Committee
Planning Subcommittee WP-3
Spectrum Utilization Working Group
Attendance (Alpha by Name)

Name	Affiliation	Mtg: 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
Peter Fannon	ATTC															x																					
Lex Felker	Wiley, Rein & Fielding																									x											
Kevin Fisher	Smith & Powstenko																																		x	x	x
Barry Fleishman	Anderson, Baker, Kill & Olick								x																												
Bruce Franca	FCC						x	x				x												x										x			
Tom Friel	EIA/CEG																	x																		
Joe Gianguinto	Group W	x	x	x	x	x		x	x	x		x		x	x		x	x	x	x		x	x	x	x	x	x	x	x		x					
Jim Gibson	David Sarnoff Research Center																											x		x						
W.E. Glenn	NYIT															x																				
Ronald J. Gnidziejko	NBC															x																				
Gordon Godfrey	FCC																																		x	x	x
Anne Goodwin	Fletcher, Heald & Hildreth														x					x																
Rick G. Gould	Telecom Systems																		x																	
David Gump	HDTV Data Corp.																					x		x		x										
David Hack	CRS/SPR Library of Congress	x	x	x	x	x	x		x	x		x		x																						
Ann Hagemann	HDTV International													x													x									
David L. Hanna	GTE Telops			x																																
George Hanover	EIA			x		x		x	x		x		x	x								x		x								x				
William Hassinger	FCC MMB				x					x				x																						
Dale Hatfield *	Hatfield Associates	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x		x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x
Howard Head	A.D. Ring & Associates								x	x	x	x		x																						
John G.N. Henderson	David Sarnoff Research Center																														x					
Rich Hindman	House Subcommittee on Telecom.					x																														
Judson Hoffman	Panasonic Technologies			x	x		x	x	x				x	x				x																		
Randy Hoffner	NBC																								x	x				x						
Robert Hopkins	ATSC														x		x															x				
John Huffman	HDTV Washington Resources																							x	x	x										
Richard Iredale	Del Ray Group													x																						
Chuck Jackson	NERA																															x				
Don Jansky	Jansky Barmat Telecom, Inc./CBS	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x		x	x	x	x	x		x	x	x		x	x	x	x	x	x
Frank Jazzo	Fletcher, Heald & Hildreth			x	x	x	x	x				x	x	x				x		x	x	x	x	x		x	x		x	x		x	x		x	x	
Mark W. Johnson	CBS								x																												
Wayne Johnson	Philips Labs													x																							
Krish Jonnalagadda	David Sarnoff Research Center	x																																			

Advanced Television Committee
Planning Subcommittee WP-3
Spectrum Utilization Working Group
Attendance (Alpha by Name)

Name	Affiliation	Mtg:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
Ralph Justus	NAB			x	x		x	x	x			x	x		x	x	x		x	x		x	x	x	x			x		x			x				
Tom Keller	NAB					x	x					x																							x			
Dick Klensch	David Sarnoff Research Center																									x	x	x	x	x	x	x	x	x	x	x	x
Bud Klueck	Fletcher, Heald & Hildreth																x	x																			
Benn Kobb	Federal Communications Tech News								x	x																			x								
Jeff Krauss	General Instrument Consultant																																	x	x	x	x
Keiichi Kubota	NHK																												x	x							
James Kutzner	PBS																																x	x	x	x	x
Ray LaForge	FCC																	x									x	x									
Ken Lager	A-Vision																						x														
Frank Lang	David Sarnoff Research Center																x																				
Bernard J. Lechner	Consultant														x																						
John C. Lee	CABSC																						x														
Louis Libin	NBC		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x		x
Marty Liebman	FCC PRB				x																																
Lawrence Lockwood	TeleResources			x	x																																
Wayne C. Luplow	Zenith															x																					
Louise Lynch	PBS			x	x																																
Paul Marrangoni	FCC OET																												x								
Robert McFarlane	Philips Labs															x												x								
James McNally	FCC MMB/EPB			x																																	
Martin Meaney	NBC		x	x	x	x	x	x	x	x		x	x	x	x	x		x						x													
Charles Mellone	NTIA/DOC							x																													
Saeed Mirzad	Pacific Bell		x		x																																
Tom Mock	EIA/CEG					x											x		x						x											
Max Muterspaugh	Thompson C.E.																x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x
Sheau Ng	David Sarnoff Research Center																												x								
Celia Nogales	Pacific Telesis																		x																		
Robert A. O'Connor	Jansky Barmat Telecom, Inc./CBS				x	x	x	x	x	x			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Randy Oster	U S WEST Advanced Technologie														x	x										x	x		x	x			x					x
Stuart Overby	Motorola		x	x	x	x		x	x	x	x	x		x																								
Thomas Pfaff	Medill News Service																								x												
Larry Phillips	Panasonic ATVL																																				x
William F. Pohts	Consulting Engineer		x																																		

Advanced Television Committee
Planning Subcommittee WP-3
Spectrum Utilization Working Group
Attendance (Alpha by Name)

Name	Affiliation	Mtg: 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
Alison Purcell	HBO							x																													
Harley Radin	Direct Broadcast Satellite Corp.		x					x	x	x	x										x															
Tom Ramstack	FCC Week Publication																							x												
Robert Rast	General Instrument																																		x		
Ed Reinhardt	SBCA				x						x		x	x																						
Charles Rhodes	ATTC		x			x				x				x		x		x	x			x	x								x					
Cinda Rishell	CRS																									x										
Jayne Roads	Hughes Aircraft																				x	x	x													
Andrew Russell	Corp. for Public Broadcasting																														x	x	x	x			
Joe Russo	ABC-TV																						x			x	x		x	x	x	x				
Jouke Rypkema	Zenith	x	x	x		x	x	x			x	x	x	x		x	x	x	x	x	x			x	x		x	x	x	x	x		x	x	x	x	x
Burnett Sams	NBC																																	x	x	x	x
Tim Schnacke	Fletcher Heald & Hildreth																																				x
Herb Schubarth	Gannett								x																												
Ed Schultz	Bell Atlantic																						x	x													
Steve Selwyn	FCC	x	x	x	x	x	x		x	x	x						x																				
Wayne Shore	COMSAT												x																								
Richard E. Shrum	Department of State														x																						
David Siddall	FCC						x	x							x			x																			
Rodney Small	FCC			x	x		x		x	x																											
Richard Solomon	MIT Media Lab					x																															
Altan Stalker	Group W		x	x		x		x		x	x	x	x	x																							
Tom Stanley	FCC						x																														
Alan Stillwell	FCC																																		x	x	x
Larrie Sutliff	Bellcore	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x		x	x		x	x
Peter Tannenwald	Arent,Fox,Kintner,Plotkin & Kahn	x	x			x	x					x									!							x	x	x	x	x	x				x
Victor Tawil	MST								x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x		x		x	x	x		x			x
Eb Tingley	EIA											x																									
Tony Uyttendaele	Capital Cities/ABC				x	x	x	x	x	x		x		x	x	x	x	x	x	x													x	x	x		x
Ted Wagner	David Sarnoff Research Center						x	x	x						x					x																	
Don Walker	Motorola		x	x	x		x		x	x		x	x	x			x	x	x	x	x	x	x		x	x	x		x				x			
John Watson	Group W						x																					x				x	x	x			x
Barbara Wellbery	PBS				x																																
Steve Wildman	Economists Inc.													x																							

Advanced Television Committee
Planning Subcommittee WP-3
Spectrum Utilization Working Group
Attendance (Alpha by Name)

Name	Affiliation	Mtg: 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
Dick Wiley	Wiley, Rein & Fielding	x																																			
Ed Williams	ATTC	x			x					x				x	x	x					x	x			x			x	x	x	x	x	x			x	x
David Workman	FCC									x																											
Kei Yamashita	Hitachi																x																				
Totals: 140 Indiv. & 74 Entities Participating		20	24	31	30	28	30	31	31	26	25	25	20	33	25	22	21	21	17	14	15	21	17	22	18	23	20	28	17	18	20	16	25	19	23	17	26

1st Meeting	12/16/87	27th Meeting	12/8/89
2nd Meeting	1/12/88	28th Meeting	1/10/90
3rd Meeting	1/28/88	29th Meeting	2/7/90
4th Meeting	2/11/88	30th Meeting	3/13/90
5th Meeting	2/23/88	31st Meeting	5/1/90
6th Meeting	3/8/88	32nd Meeting	6/20/90
7th Meeting	3/22/88	33rd Meeting	9/11/90
8th Meeting	4/5/88	34th Meeting	10/30/90
9th Meeting	4/19/88	35th Meeting	12/5/90
10th Meeting	5/10/88	36th Meeting	1/16/91
11th Meeting	6/2/88	37th Meeting	2/12/91
12th Meeting	6/27/88		
13th Meeting	8/3/88		
14th Meeting	9/8/88		
15th Meeting	10/19/88	* Chairman	
16th Meeting	11/22/88		
17th Meeting	12/21/88		
18th Meeting	1/11/89		
19th Meeting	1/24/89		
20th Meeting	2/17/89		
21st Meeting	3/23/89		
22nd Meeting	5/22/89		
23rd Meeting	7/5/89		
24th Meeting	9/7/89		
25th Meeting	10/5/89		
26th Meeting	11/7/89		

02/20/91

Advanced Television Committee
Planning Subcommittee WP-3
Spectrum Utilization Working Group
Attendance (By Affiliation)

Name	Affiliation	Mtg: 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
Ken Lager	A-Vision																					x															
Howard Head	A.D. Ring & Associates								x	x	x	x		x																							
Joe Russo	ABC-TV																						x			x	x		x	x	x	x				
Robert Hopkins	ATSC														x		x																x				
Ben Crutchfield	ATTC										x								x																		
Robert DeSantis	ATTC																									x											
Peter Fannon	ATTC															x																					
Charles Rhodes	ATTC		x			x				x				x		x		x	x			x	x								x						
Ed Williams	ATTC	x			x					x				x	x	x				x	x			x		x	x	x	x	x	x		x	x		x	x
Barry Fleishman	Anderson, Baker, Kill & Olick								x																												
Peter Tannenwald	Arent,Fox,Kintner,Plotkin & Kahn	x	x			x	x					x															x	x	x	x	x	x				x
Ed Schultz	Bell Atlantic																							x													
Pat Daley	Bellcore																																	x			
Larrie Sutliff	Bellcore	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x		x	x		x	x
John C. Lee	CABSC																					x															
Mark W. Johnson	CBS								x																												
Krishna Bhatnagar	COMSAT																																x				
Wayne Shore	COMSAT												x																								
Cinda Rishell	CRS																									x											
David Hack	CRS/SPR Library of Congress	x	x	x	x	x	x		x	x		x		x																							
Kenneth Brown	Capital Cities/ABC										x																										
Tony Uyttendaele	Capital Cities/ABC				x	x	x	x	x	x		x		x	x	x	x	x	x	x													x	x	x		x
Bernard J. Lechner	Consultant													x																							
William F. Pohts	Consulting Engineer	x																																			
Ted Coltman	Corp. for Public Broadcasting			x	x	x	x	x		x	x	x		x	x	x	x				x			x		x	x			x	x					x
Andrew Russell	Corp. for Public Broadcasting																														x	x	x	x			
Jim Gibson	David Sarnoff Research Center																											x		x							
John G.N. Henderson	David Sarnoff Research Center																															x					
Krish Jonnalagadda	David Sarnoff Research Center	x																																			
Dick Klensch	David Sarnoff Research Center																									x	x	x	x	x	x	x	x	x	x	x	x
Frank Lang	David Sarnoff Research Center															x																					
Sheau Ng	David Sarnoff Research Center																											x									
Ted Wagner	David Sarnoff Research Center						x	x	x						x					x																	
Richard Iredale	Del Ray Group													x																							

Advanced Television Committee
Planning Subcommittee WP-3
Spectrum Utilization Working Group
Attendance (By Affiliation)

Name	Affiliation	Mtg: 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
Richard E. Shrum	Department of State														x																						
Harley Radin	Direct Broadcast Satellite Corp.		x					x	x	x	x										x																
George Hanover	EIA			x		x		x	x		x		x	x								x		x									x				
Eb Tingley	EIA											x																									
Tom Friel	EIA/CEG																	x																			
Tom Mock	EIA/CEG				x											x		x							x												
Ken Dunmore	Economists Inc.													x																							
Steve Wildman	Economists Inc.													x																							
Linda Dubroof	FCC																									x											
Bob Eckert	FCC									x		x	x	x	x		x					x	x		x	x		x		x	x	x	x		x	x	x
Bruce Franca	FCC						x	x				x													x										x		
Gordon Godfrey	FCC																																		x	x	x
Ray LaForge	FCC																x										x	x									
Steve Selwyn	FCC		x	x	x	x	x	x	x	x	x						x																				
David Siddall	FCC						x	x							x			x																			
Rodney Small	FCC			x	x		x		x	x																											
Tom Stanley	FCC						x																														
Alan Stillwell	FCC																																		x	x	x
David Workman	FCC									x																											
Hector Davis	FCC Laboratory																																		x		
William Hassinger	FCC MMB				x					x				x																							
James McNally	FCC MMB/EPB		x																																		
Paul Marrangoni	FCC OET																											x									
Marty Liebman	FCC PRB			x																																	
Tom Ramstack	FCC Week Publication																							x													
Benn Kobb	Federal Communications Tech News							x	x																			x									
Tim Schnacke	Fletcher Heald & Hildreth																																				x
James G. Ennis	Fletcher, Heald & Hildreth	x						x	x		x								x								x	x						x			
Anne Goodwin	Fletcher, Heald & Hildreth														x					x																	
Frank Jazzo	Fletcher, Heald & Hildreth			x	x	x	x	x				x	x	x				x		x	x	x	x	x		x	x		x	x		x	x		x	x	
Bud Klueck	Fletcher, Heald & Hildreth															x	x																				
Jennifer Clayborne	GAO														x																						
Karen Brown	GAO/IMTEC																										x									
David L. Hanna	GTE Telops			x																																

Advanced Television Committee
Planning Subcommittee WP-3
Spectrum Utilization Working Group
Attendance (By Affiliation)

Name		Affiliation	Mtg:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
Herb Schubarth		Gannett									x																											
Robert Rast		General Instrument																																		x			
Jeff Krauss		General Instrument Consultant																																	x	x	x	x
Christina Black		George Washington University			x	x	x		x	x	x	x																										
Joe Gianguinto		Group W		x	x	x	x	x		x	x	x		x		x	x		x	x	x	x		x	x	x	x	x	x	x	x		x					
Altan Stalker		Group W			x	x		x		x		x	x	x	x	x																						
John Watson		Group W							x																					x				x	x	x			x
Chris Ehrenbard		HBO					x	x	x									x																				
Alison Purcell		HBO								x																												
David Gump		HDTV Data Corp.																						x		x		x										
Ann Hagemann		HDTV International														x													x									
John Huffman		HDTV Washington Resources																								x	x	x										
William Byrnes		Haley, Bader & Potts																						x								e						
Dale Hatfield	*	Hatfield Associates		x	x	x	x	x		x	x	x	x	x	x	x	x	x	x		x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x
Kei Yamashita		Hitachi																	x																			
Rich Hindman		House Subcommittee on Telecom.						x																														
Jayne Roads		Hughes Aircraft																					x	x	x													
Don Jansky		Jansky Barmat Telecom, Inc./CBS		x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x		x	x	x	x	x		x	x	x		x	x	x	x	x	x
Robert A. O'Connor		Jansky Barmat Telecom, Inc./CBS				x	x	x	x	x	x			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Jules Cohen		Jules Cohen & Associates/MST				x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x		x	x	x	x	x	x		x		x	x	x		x
Bob Denny		Jules Cohen & Associates/MST		x	x	x	x	x	x	x	x	x	x																									
Aileen Amarandos		Latham & Watkins								x	x																											
Richard Solomon		MIT Media Lab						x																														
Gregory DePriest		MST		x	x		x	x	x	x	x			x	x	x	x	x										x		x								
Victor Tawil		MST									x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x		x		x	x	x		x		x
Thomas Pfaff		Medill News Service																								x												
William M. Borman		Motorola		x	x		x	x	x	x			x	x	x		x		x	x				x								x	x					
Allen Davidson		Motorola																						x					x									
Stuart Overby		Motorola		x	x	x	x		x	x	x	x	x		x																							
Don Walker		Motorola			x	x	x		x		x	x		x	x	x	.		x	x	x	x	x	x	x		x	x	x		x				x			
Lynn Claudy		NAB																	x	x					x	x	x	x	x		x		x	x	x		x	
Ed Cohen		NAB																								x												
Ralph Justus		NAB			x	x		x	x	x			x	x		x	x	x		x	x		x	x	x	x				x		x			x			
Tom Keller		NAB					x	x					x																								x		

Advanced Television Committee
Planning Subcommittee WP-3
Spectrum Utilization Working Group
Attendance (By Affiliation)

Name	Affiliation	Mtg: 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
Ronald Gnidziejko	NBC															x																					
Randy Hoffner	NBC																								x	x				x							
Louis Libin	NBC	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x		x
Martin Meaney	NBC	x	x	x	x	x	x	x	x		x	x	x	x	x		x						x														
Burnett Sams	NBC																																	x	x	x	x
Chuck Jackson	NERA																															x					
Keiichi Kubota	NHK																										x	x									
Martin Billips	NPR																																				
Karen Christansen	NPR			x		x																															
David Cohen	NTIA		x					x	x																												
Charles Mellone	NTIA/DOC						x																														
W.E. Glenn	NYIT															x																					
A. James Ebel	Network Affiliats			x	x																																
Harvey Arnold	North Carolina Public TV																																	x	x	x	x
Frank Bugg	PBS				x	x	x	x		x	x				x																						
James Kutzner	PBS																																x	x	x	x	x
Louise Lynch	PBS		x	x																																	
Barbara Wellbery	PBS				x																																
Saeed Mirzad	Pacific Bell	x		x																																	
Celia Nogales	Pacific Telesis																	x																			
Larry Phillips	Panasonic ATVL																																				x
Judson Hoffman	Panasonic Technologies			x	x		x	x	x				x	x				x																			
Aldo G. Cugnini	Philips Labs																											x									
Wayne Johnson	Philips Labs													x																							
Robert McFarlane	Philips Labs														x													x									
Ed Reinhardt	SBCA				x						x		x	x																							
Kevin Fisher	Smith & Powstenko																																		x	x	x
Lawrence Lockwood	TeleResources		x	x																																	
Rick G. Gould	Telecom Systems																		x																		
Kathy Dale	Televisa			x																																	
Joe Donahue	Thompson C.E.																															x					
Max Muterspaugh	Thompson C.E.															x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x
Randy Oster	U S WEST Advanced Technologie													x	x										x	x		x	x			x					x
Paul Beeman	Viacom Networks								x	x	x	x																									